

A2.1.2.2.2 Characteristics of reference systems in the fixed service

The following parameters represent the set of reference parameters of the fixed service.

A2.1.2.2.2.1 Characteristics of reference digital point-to-point systems

Three different digital systems are described in this table:

- 64 kbit/s capacity used, for example, for outside-plant (individual subscriber connection);
- 2 Mbit/s capacity used, for example, for business subscriber connections for the local part of the inside-plant;
- 45 Mbit/s capacity used, for example, for trunk networks.

Capacity	64 kbit/s	2 Mbit/s	45 Mbit/s
Modulation	4-PSK	8-PSK	64-QAM
Antenna gain (dB)	33	33	33
Transmit power (dBW)	7	7	1
Feeder/multiplexer loss (dB)	2	2	2
e.i.r.p. (dBW)	38	38	32
Receiver IF bandwidth (MHz)	0.032	0.7	10
Receiver noise figure (dB)	4	4.5	4
Receiver input level for a BER of 10^{-3} (dBW)	-137	-120	-106
Maximum long-term interference	-165	-151	-136
Total power (dBW)			
Maximum long-term interference	-174	-173	-170
Power spectral density (dB(W/4 kHz))			

Antenna pattern:

$$\begin{aligned}
 G(\varphi) &= G_{\max} - 2.5 \times 10^{-3} \left(\frac{D\varphi}{\lambda} \right)^2 && \text{for } 0 < \varphi < \varphi_m \\
 G(\varphi) &= G_1 && \text{for } \varphi_m \leq \varphi < 75.86(\lambda/D) \\
 G(\varphi) &= 49 - 10 \log(D/\lambda) - 25 \log \varphi && \text{for } 75.86(\lambda/D) \leq \varphi < 48^\circ \\
 G(\varphi) &= 7 - 10 \log(D/\lambda) && \text{for } 48^\circ \leq \varphi
 \end{aligned}$$

where:

$G(\varphi)$: gain relative to an isotropic antenna (dBi)
 φ : off-axis angle (degree)
 D : antenna diameter
 λ : wavelength expressed in the same unit as D
 G_1 : gain of the first side-lobe = $2 + 15 \log(D/\lambda)$
 (D/λ) may be estimated from $20 \log D/\lambda \approx G_{\max} - 7.7$
 G_{\max} : main lobe antenna gain (dBi)
 $\varphi_m = 20 (\lambda/D) \times \sqrt{(G_{\max} - G_1)}$ (degrees)

It should be noted that the above antenna radiation pattern corresponds to the average side-lobe pattern and it is recognized that individual side-lobes may exceed it by up to 3 dB.

A2.1.2.2.2 Characteristics of reference analogue point-to-point systems

Antenna gain (dBi)	33
e.i.r.p. (dBW)	36
Feeder/multiplexer loss (dB)	3
Receiver noise figure (referred to input of receiver) (dB)	8
Maximum long-term interference per link (20% of time) (dB(W/4 kHz))	-170

Antenna pattern: Use antenna pattern of section 2.2.1.

A2.1.2.2.3 Characteristics of reference point-to-multipoint systems

Parameter	Central station	Outstation
Antenna type	Omni/Sectoral	Dish/Horn
Antenna gain (dBi)	10/13	20 (analogue) 27 (digital)
e.i.r.p. (max) (dBW)		
analogue	12	21
digital	24	34
Noise figure (dB)	3.5	3.5
Feeder loss (dB)	2	2
IF bandwidth (MHz)	3.5	3.5
Maximum permissible long-term interference power (20% time)		
Total (dBW)	-142	-142
dB (W/4 kHz)	-170	-170
dB (W/MHz)	-147	-147

Antenna pattern:

For the outstation antenna pattern, the reference pattern described in section 2.2.1 has to be used.

The reference radiation pattern for omnidirectional or sectoral antennas is the following:

$$\begin{aligned} G(\theta) &= G_0 - 12 (\theta/\varphi_3)^2, \text{ dBi} & 0 \leq \theta < \varphi_3 \\ G(\theta) &= G_0 - 12 - 10 \log (\theta/\varphi_3), \text{ dBi} & \varphi_3 \leq \theta \leq 90^\circ \end{aligned}$$

where:

G_0 = maximum gain in the horizontal plane (dBi)

θ is the radiation angle above the horizontal plane (degrees)

φ_3 (degrees) is given by:

$$\varphi_3 = \frac{1}{\alpha^2 - 0.818}, \text{ degrees}$$

where:

$$\alpha = \frac{10^{0.1G_0} + 172.4}{191}$$

It should be noted that the above antenna pattern is provisional and that further study is under way in the ITU-R.

A2.1.2.3 Determination of the need for coordination between MSS space stations (space-to-Earth) and terrestrial stations

A2.1.2.3.1 Method for the determination of the need for coordination between MSS space stations (space-to-Earth) and other terrestrial services sharing the same frequency band in the 1 to 3 GHz range

Coordination of space stations of the mobile-satellite service downlink with respect to terrestrial services is not required if the power flux-density produced at the Earth's surface or the fractional degradation in performance (FDP) of a station in the fixed service does not exceed the threshold values shown in the table.

Frequency band (MHz)	Service to be protected	Coordination threshold values				
		Geostationary space stations		Non-geostationary space stations		
		pfd (per space station) calculation factors (NOTE 2)		pfd (per space station) calculation factors (NOTE 2)		% FDP (in 1 MHz) (NOTE 1)
		P dB(W/m ²) in 4 kHz	r dB/deg	P dB(W/m ²) in 4 kHz	r dB/deg	
1 492 - 1 525	analogue FS	-152	0.5	-152	0.5	
	digital FS	-152	0.5			25
	other terrestrial services (NOTE 4)	-152	0.5	-152	0.5	
1 525 - 1 530	analogue FS	-152	0.5	-152	0.5	
	digital FS	-152	0.5			25
	other terrestrial services (NOTE 4)	-152	0.5	-152	0.5	
2 160 - 2 200 (NOTE 3)	analogue FS	-152	0.5	-147	0.5	
	digital FS	-152	0.5			25
	other terrestrial services (NOTE 4)	-152	0.5	-147	0.5	
2 483.5 - 2 500	fixed	-152	0.5	-150	0.65	
	other terrestrial services (NOTE 4)	-152	0.5	-150	0.65	
2 500 - 2 520	analogue FS	-152	0.5	-152	0.5	
	digital FS	-152	0.5			25
	other terrestrial services (NOTE 4)	-152	0.5	-152	0.5	
2 520 - 2 535	analogue FS	-160	0.75	-152	0.5	
	digital FS	-160	0.75			25
	other terrestrial services (NOTE 4)	-160	0.75	-152	0.5	

NOTE 1 – The calculation of FDP (fractional degradation in performance) is contained in section 2.1, using reference FS parameters contained in sections 2.2.1 and 2.2.3.

NOTE 2 – The following formula should be used for deriving the coordination threshold in terms of power flux-density:

$P \text{ dB(W/m}^2\text{/4 kHz)}$	for $0^\circ \leq \delta \leq 5^\circ$
$P + r(\delta-5) \text{ dB(W/m}^2\text{/4 kHz)}$	for $5^\circ < \delta < 25^\circ$
$P + 20r \text{ dB(W/m}^2\text{/4 kHz)}$	for $25^\circ \leq \delta \leq 90^\circ$

where δ is the angle of arrival (degrees).

The threshold values are obtained under assumed free-space propagation conditions.

NOTE 3 – The coordination threshold in the band 2 160 - 2 270 MHz (Region 2) and 2 170 - 2 200 MHz (all regions) to protect other terrestrial services does not apply to the terrestrial component of the Future Public Land Mobile Telecommunication Systems (FPLMTS), as the satellite and the terrestrial components are not intended to operate in the same area or on common frequencies within these bands.

NOTE 4 – The coordination threshold factors applicable to other terrestrial services may be reviewed at a future conference, as necessary.

A2.1.2.3.2 A system-specific methodology (SSM) to be used in determining the need for detailed coordination of NGSO MSS (space-to-Earth) systems with fixed service systems

The purpose of the system-specific methodology (SSM) is to allow a detailed assessment of the need to coordinate frequency assignments to non-GSO MSS space stations (space-to-Earth) with frequency assignments to receiving stations in an FS network of a potentially affected administration. The SSM takes into account specific characteristics of the non-GSO MSS system and reference FS characteristics.

Those administrations planning to establish the need for coordination between non-geostationary-satellite networks in the mobile-satellite service and fixed service systems are encouraged to use Recommendation ITU-R IS.1143. While urgent additional development work is being undertaken in the ITU-R to facilitate the use of the methodology described in Recommendation ITU-R IS.1143, administrations may be able to effect coordination by applying this system-specific methodology.

A2.1.3 Above 3 GHz

In the band 15.45 - 15.65 GHz, when an administration proposes to use a non-geostationary space station whose emissions exceed -146 dB(W/m²/MHz) for all angles of arrival, it shall coordinate with affected administrations.

A2.2 Hard limits

A2.2.1 Sharing between feeder links of the non-GSO MSS (space-to-Earth) and terrestrial services in the same frequency bands

The power flux-density at the Earth's surface produced by space stations of the fixed-satellite service operating in the space-to-Earth direction in the band 5 150 - 5 216 MHz shall in no case exceed -164 dB(W/m²) in any 4 kHz band for all angles of arrival.

Emissions from a non-geostationary space station shall not exceed the following limits at the Earth's surface:

Frequency band	Service	Limit in dB(W/m ²) for angle of arrival above the horizontal plane			Reference bandwidth
		0° - 5°	5° - 25°	25° - 90°	
6 700 - 6 825 MHz	Fixed-Satellite (S-E)	-137	-137 + 0.5 (δ-5)	-127	1 MHz
6 825 - 7 075 MHz	Fixed-Satellite (S-E)	-154 and	-154 + 0.5 (δ-5) and	-144 and	4 kHz
		-134	-134 + 0.5 (δ-5)	-124	1 MHz

Emissions from a non-geostationary space station shall not exceed the power flux-density limits at the Earth's surface of -146 dB(W/m²/MHz) in the bands 15.4 - 15.45 GHz and 15.65 - 15.7 GHz, and -111 dB(W/m²/MHz) in the band 15.45 - 15.65 GHz for all angles of arrival. These limits relate to the power flux-density which would be obtained under assumed free-space propagation conditions.

Power flux-density limits between 17.7 GHz and 27.5 GHz.

The power flux-density at the Earth's surface produced by emissions from a space station, including emissions from a reflecting satellite, for all conditions and for all methods of modulation, shall not exceed the following values:

- 115 dB(W/m²) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;
- 115 + 0.5(δ-5) dB(W/m²) in any 1 MHz band for angles of arrival δ between 5 and 25 degrees above the horizontal plane;
- 105 dB(W/m²) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

These limits relate to the power flux-density which would be obtained under assumed free-space propagation conditions.

In the band 19.3 - 19.7 GHz for non-geostationary satellite systems, these values shall apply subject to review by the ITU-R and the results of this review should be considered by WRC-97 (see Resolution COM5-1).

A2.2.2 Power flux-density limits produced by non-GSO MSS feeder links with respect to the GSO orbit

In the frequency band 6 700 - 7 075 MHz, the maximum aggregate power flux-density produced at the GSO and including $\pm 5^\circ$ of inclination around the geostationary-satellite orbit by a non-geostationary-satellite system in the fixed-satellite service shall not exceed -168 dB(W/m²) in any 4 kHz band.

A2.2.3 Power flux-density limits produced by the non-GSO FSS in the 20 - 30 GHz band

The power flux-density at the Earth's surface produced by emissions from a space station shall not exceed the following values:

- 115 dB(W/m²) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;
- 115 + 0.5($\delta - 5$) dB(W/m²) in any 1 MHz band for angles of arrival δ between 5 and 25 degrees above the horizontal plane;
- 105 dB(W/m²) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

These limits relate to the power flux-density which could be obtained under assumed free-space propagation conditions.

In the band 18.9 - 19.3 GHz for non-GSO satellite systems, these values shall apply subject to review by the ITU-R and the results of this review should be considered by WRC-97 (see Resolution PLEN-1).

A2.2.4 Power limits for terrestrial stations

In the band 19.3 - 19.6 GHz, the maximum equivalent isotropically radiated power (e.i.r.p.) of a station in the fixed service or mobile service shall not exceed 55 dBW and the power delivered to the antenna shall not exceed +10 dBW.

A2.2.5 Power limits for earth stations

In the band 19.3 - 19.6 GHz, the equivalent isotropically radiated power (e.i.r.p.) transmitted in any direction towards the horizon by a feeder-link earth station of the mobile-satellite service shall not exceed the following limits:

- +64 dBW in any 1 MHz band for $\theta \leq 0^\circ$
- +64 + 3 θ dBW in any 1 MHz band for $0^\circ \leq \theta < 5^\circ$,

where θ is the angle of elevation of the horizon viewed from the centre of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

These limits may be exceeded by not more than 10 dB. However, when the resulting coordination area extends into the territory of another country, such increase shall be subject to agreement by the administration of that country.

A2.3 Coordination areas for mobile earth stations operating below 3 GHz and earth stations providing feeder links for non-geostationary satellites operating in the mobile-satellite service and for non-GSO FSS earth stations

A2.3.1 Objectives

In order to apply the provisions of Sections III and IV, paragraphs 3.1 and 4.1 of the Annex 1 to Resolution 46(Rev.WRC-95), this Section specifies the coordination area (see No. 165 of the Radio Regulations) for mobile earth stations as well as earth stations providing feeder links for non-geostationary-satellite networks operating in the mobile-satellite service. In both cases, the coordination contour (see No. 166 of the Radio Regulations) associated with the coordination area is drawn to scale on an appropriate map in order to depict the coordination area and the extent to which it overlaps the territory of administrations that may be affected. Tables 1-3 specify coordination distances (see No. 167 of the Radio Regulations) for certain frequency sharing situations and frequency bands in which the provisions of Resolution 46(Rev.WRC-95) are applied. Table 4 applies to non-GSO FSS earth stations.

The coordination area of a mobile earth station is determined as the service area in which it is intended to operate typical earth stations, extended in all directions by the coordination distance. Tables 1 and 2 specify coordination distances for mobile earth stations operating below 1 GHz and in the 1 - 3 GHz frequency range, respectively. In the case of feeder-link earth stations, the coordination contour is determined as the end points of coordination distances measured from the earth station location. Coordination distances for feeder-link earth stations operating below 1 GHz are specified in Table 1. Coordination distances for feeder-link earth stations operating above 5 GHz are specified in Table 3 with respect to stations in terrestrial services and, where applicable, earth stations of other satellite networks operating in the opposite direction of transmission. Coordination distances for non-GSO FSS earth stations are specified in Table 4.

A2.3.2 General considerations

Two types of coordination distances are specified in Tables 1-4: 1) predetermined distances, and 2) distances that are to be calculated on a case-by-case basis, taking into account specific parameters of the earth station for which the coordination area is being determined. Neither of these distances indicate required separation distances.

It must be emphasized that the presence or installation of another station within the coordination area of an earth station would not necessarily preclude the satisfactory operation of either the earth station or the other station, since coordination distances are based on the most unfavourable case assumptions as regards interference.

The different coordination distances may be reviewed at a future conference conforming to the relevant Resolution.

TABLE 1
Earth stations operating at frequencies below 1 GHz

Frequency Sharing Situation		Coordination Distance (In sharing situations involving services allocated with equal rights)
Frequency band and earth station for which coordination area is determined	Other service or station (station in terrestrial service)	
148.0 - 149.9 MHz ground-based (mobile) 149.9 - 150.05 MHz ground-based (mobile)	ground-based stations	As determined using Equation (1) and Figure 1 of Recommendation ITU-R M.[8/1035] In this case, the coordination distance is calculated by the administration of the terrestrial station using the parameters of its terrestrial stations and the relevant parameters taken from the advance publication for the earth station.
400.15 - 401 MHz ground-based	meteorological aids (radiosonde)	582 km
All bands below 1 GHz ground-based	mobile (aircraft)	500 km
All bands below 1 GHz aircraft (mobile)	ground-based stations	500 km
400.15 - 401 MHz aircraft (mobile)	meteorological aids (radiosonde)	1 082 km
All bands below 1 GHz aircraft (mobile)	mobile (aircraft)	1 000 km
455 - 456 MHz 459 - 460 MHz ground-based	ground-based stations	500 km

TABLE 2
Earth stations operating at frequencies in the 1 - 3 GHz range

Frequency Sharing Situation		Coordination Distance (In sharing situations involving services allocated with equal rights)
Frequency band and earth station for which coordination area is determined	Other service or station (station in terrestrial service or earth station)	
ground-based mobile (NOTE 1) (GSO network)	ground-based stations in terrestrial services	Determined using Recommendation ITU-R IS.847 with the parameters specified therein for terrestrial stations and all applicable equations and figures.
ground-based mobile (NOTE 1) (non-GSO network)	ground-based stations in terrestrial services	The methodology of Recommendation ITU-R IS.849 is applied in conjunction with Recommendation ITU-R IS.847 (see above).
1 675 - 1 700 MHz ground-based mobile	meteorological aids (radiosonde)	582 km
All bands, 1 - 3 GHz ground-based mobile	terrestrial mobile (aircraft)	500 km
All bands aircraft (mobile)	ground-based stations in terrestrial services	500 km
1 675 - 1 700 MHz aircraft (mobile)	meteorological aids (radiosonde)	1 082 km
All bands aircraft (mobile)	terrestrial mobile (aircraft)	1 000 km

NOTE 1 – Recommendation ITU-R IS.847 supplies the necessary terrestrial station parameters for the bands 1 492 - 1 530 MHz, 1 555 - 1 559 MHz, 1 610 - 1 645.5 MHz, 1 646.5 - 1 660 MHz, 1 675 - 1 710 MHz, 1 980 - 2 025 MHz, 2 160 - 2 200 MHz, 2 483.5 - 2 520 MHz, and 2 655 - 2 690 MHz.

TABLE 3
Non-GSO MSS feeder-link earth stations

Frequency Sharing Situation		Coordination Distance (In sharing situations involving services that are allocated with equal rights)
Frequency band and earth station for which coordination area is determined	Other service or station (station in terrestrial service or earth station)	
19.3 - 19.7 GHz and 29.1 - 29.5 GHz; earth station operating co-directionally with other earth stations	ground-based stations in terrestrial services	Determined using Recommendations ITU-R IS.847 and IS.849 with the parameters specified therein for terrestrial stations and all applicable equations and figures.
Bands in which the FSS is already allocated; earth station operating in opposite direction	ground-based stations in terrestrial services	A) 19.3 - 19.7 GHz: 170 km; B) 6 700 - 7 075 MHz: 300 km.
All bands and earth stations	terrestrial mobile (aircraft)	500 km
Bands in which the FSS is already allocated; earth station operating in opposite direction	earth station operating in opposite direction of transmission	A) 19.3 - 19.7 GHz: 170 km; B) 6 700 - 7 075 MHz: 300 km.

TABLE 4
Non-GSO FSS earth stations

Frequency Sharing Situation		Coordination Distance (In sharing situations involving services that are allocated with equal rights)
Frequency band and earth station for which coordination area is determined	Other service or station (station in terrestrial service or earth station)	
18.9 - 19.3 GHz and 28.7 - 29.1 GHz; earth station operating co-directionally with other earth stations	ground-based stations in terrestrial services	Determined using Recommendations ITU-R IS.847 and IS.849 with the parameters specified therein for terrestrial stations and all applicable equations and figures.

RESOLUTION 212 (REV.WRC-95)

**IMPLEMENTATION OF FUTURE PUBLIC LAND MOBILE
TELECOMMUNICATION SYSTEMS (FPLMTS)**

The World Radiocommunication Conference (Geneva, 1995),

considering

- a) that ITU-R has recommended the 1 - 3 GHz band as the most suitable for FPLMTS;
- b) that ITU-R has recommended approximately 60 MHz for use by personal stations and approximately 170 MHz for use by mobile stations;
- c) that ITU-R has recognized that space techniques are an integral part of FPLMTS;
- d) that, in No. S5.388 of the Radio Regulations, this Conference has identified bands to accommodate this future service,

considering further

- a) that ITU-R has not completed its studies regarding duplexing methods, modulation techniques, channelling arrangements, signalling or communication protocols;
- b) that no worldwide intersystem numbering plan currently exists that would facilitate worldwide roaming,

noting

- a) that the implementation of the terrestrial components of FPLMTS in the bands 1 885 - 2 025 MHz and 2 110 - 2 200 MHz is expected to commence around the year 2000 subject to market and technical considerations;
- b) that the availability of the satellite component of FPLMTS in the bands 1 980 - 2 010 MHz and 2 170 - 2 200 MHz simultaneously with the terrestrial component of FPLMTS in the bands identified in No. S5.388 would improve the overall implementation and the attractiveness of FPLMTS to both developed and developing countries,

invites administrations

to give due consideration to the accommodation of other services currently operating in these bands when implementing FPLMTS,

invites ITU-R

to continue its studies with a view to developing suitable and acceptable technical characteristics for FPLMTS that will facilitate worldwide use and roaming, and ensure that FPLMTS can also meet the telecommunication needs of the developing countries and rural areas,

invites ITU-T

- a) to complete its studies of signalling and communication protocols;
- b) to develop a common worldwide intersystem numbering plan and associated network capabilities that will facilitate worldwide roaming,

resolves

that administrations which implement FPLMTS:

- a) should make the necessary frequencies available for system development;
- b) should use those frequencies when FPLMTS are implemented;
- c) should use the relevant international technical characteristics, as identified by the Recommendations of the ITU-R and ITU-T.

RESOLUTION 213 (REV.WRC-95)

**SHARING STUDIES CONCERNING POSSIBLE USE
OF THE BAND 1 675 - 1 710 MHz BY THE
MOBILE-SATELLITE SERVICE**

The World Radiocommunication Conference (Geneva, 1995),

considering

- a) that the agenda of this Conference requested the consideration, *inter alia*, of a review of the technical constraints associated with the allocation to the mobile-satellite service (MSS);
- b) that the frequency band 1 675 - 1 710 MHz is already allocated to the MSS (Earth-to-space) on a primary basis in Region 2;
- c) that this Conference considered proposals for reducing the technical constraints on the MSS for part of the frequency band 1 675 - 1 710 MHz, but concluded that the required studies were incomplete;
- d) that the band 1 675 - 1 710 MHz is mainly used by the meteorological-satellite and meteorological aids services, and studies indicate that parts of this band are used by the meteorological-satellite service in a way which may allow sharing with the MSS, but that there are currently more than 5 400 meteorological-satellite receiving terminals in the band 1 690 - 1 710 MHz registered with the World Meteorological Organization (WMO);
- e) that there are few main meteorological earth stations in the 1 675 - 1 690 MHz band, but these are the main control and operating stations for meteorological-satellite systems and must therefore receive adequate protection;
- f) that studies to date and the conclusions of the 1995 Conference Preparatory Meeting indicate that sharing of part of the band 1 675 - 1 710 MHz between the meteorological-satellite and the mobile-satellite services may be feasible, taking into account Recommendation ITU-R SA.1158 and the results of other sharing studies still to be completed;
- g) that parts of the frequency band 1 675 - 1 710 MHz are also allocated to the fixed and mobile services;
- h) that improvements in some of the radiocommunication characteristics of meteorological aids are technically possible, and that these may improve sharing possibilities;
- i) that the cost impact of improving the radiocommunication characteristics of meteorological aids may reduce their usage in large areas of the world (see Recommendation ITU-R SA.1165);

j) that there is a need to determine the operational and technical means of preventing harmful interference to the services referred to in d) above,

resolves to invite ITU-R

as a matter of urgency, and in time for the 1997 World Radiocommunication Conference (WRC-97), to complete the technical and operational studies on the feasibility of sharing of the band concerned between the services referred to in d) and g) above and the MSS, and on the required means for preventing harmful interference,

further invites

1 administrations and interested parties (e.g. WMO) to participate actively in such studies, by submitting relevant contributions;

2 ITU-R to investigate a potentially suitable downlink band that may assist in meeting the spectrum requirements of the MSS,

instructs the Secretary-General

to bring this Resolution to the notice of WMO.

RESOLUTION 712 (REV.WRC-95)

**CONSIDERATION BY A FUTURE COMPETENT WORLD RADIOCOMMUNICATION
CONFERENCE OF ISSUES DEALING WITH ALLOCATIONS
TO SPACE SERVICES**

The World Radiocommunication Conference (Geneva, 1995),

considering

- a) that the agenda of the World Administrative Radio Conference (Malaga-Torremolinos, 1992) (WARC-92) called for the development of new recommendations and resolutions relating to allocations to space services which were not placed on the agenda of that Conference;
- b) that Recommendation ITU-R SA.363-5 recommends that frequencies below 1 GHz are technically suitable for telecommand of satellites operating below an altitude of 2 000 km;
- c) that the United Nations Conference on Environment and Development (UNCED) (Rio de Janeiro, 1992) identified an urgent need for systematic observations of forest cover, and that such observations can best be performed using frequencies in the range 420 - 470 MHz;
- d) that Resolution 35 of the ITU Plenipotentiary Conference (Kyoto, 1994) considered that application of the latest telecommunication and information technologies, especially those associated with space systems, can be extremely useful in implementing and conducting environment protection activities such as monitoring air, river, harbour and sea pollution, remote sensing, wildlife studies, forestry development, and others;
- e) that the status of existing allocations available for use by active space-based sensors between 1 and 25 GHz, in frequency bands shared with radiolocation or radionavigation systems, needs to be reviewed in order to facilitate worldwide usage by active space-based sensors;
- f) that the allocations to the Earth exploration-satellite service in the frequency bands 8.025 - 8.4 GHz and 18.6 - 18.8 GHz are complex and not uniform worldwide, and that the band 18.6 - 18.8 GHz is vital for passive sensing of ecologically important data;
- g) that the allocation of the frequency band 13.75 - 14 GHz to the fixed-satellite service by WARC-92 reduced the total bandwidth available for active space-based sensors in the frequency range 13 - 14 GHz, which is important for wideband sensor instruments, e.g. radar altimeters, scatterometers;
- h) that future active Earth sensing requirements for monitoring environmental data in the 35 and 95 GHz ranges have been identified;
- i) that ITU-R has agreed to certain important technical parameters required for coordination of the space services under Appendix 28 [S7] of the Radio Regulations,

resolves

that, based on proposals from administrations and taking into account the results of studies in the ITU-R study groups and the Conference Preparatory Meeting (CPM-97), the 1997 World Radiocommunication Conference should consider the following matters:

- 1 provision of up to 3 MHz of frequency spectrum for the implementation of telecommand links in the space research and space operation services in the frequency range between 100 MHz and 1 GHz;
- 2 provision of up to 3.5 MHz of frequency spectrum to the Earth exploration-satellite service (active) in the frequency range 420 to 470 MHz;
- 3 use of existing allocations by space-based active sensors operating in the Earth exploration-satellite and space research services in frequency bands shared with the radiolocation or radionavigation services, between 1 and 25 GHz, with a view to the possibility of establishing common worldwide primary allocations;
- 4 use of existing allocations in the frequency range from 7 to 20 GHz to the Earth exploration-satellite, meteorological-satellite, space research and space operation services, with a view to the possibility of establishing common worldwide primary allocations to these services in appropriate bands, taking into account Recommendation 706 (WARC-79);
- 5 provision of up to 500 MHz of frequency spectrum around 35 GHz and up to 1 GHz of frequency spectrum around 95 GHz for use by space-based active Earth sensors;
- 6 inclusion of ITU-R approved technical coordination parameters in Appendix 28 [S7] of the Radio Regulations, taking into account Resolution 60 (WARC-79) and Recommendation 711 (WARC-79),

invites the ITU-R study groups

to carry out the necessary studies, taking into account the present uses of allocated bands, with a view to presenting, at the appropriate time, the technical information likely to be required as a basis for the work of the Conference,

instructs the Secretary-General

to bring this Resolution to the attention of the international and regional organizations concerned.

RESOLUTION PLEN-1

**USE OF THE BANDS 18.8 - 19.3 GHz AND 28.6 - 29.1 GHz BY
NON-GEOSTATIONARY FIXED-SATELLITE SERVICE SYSTEMS**

The World Radiocommunication Conference (Geneva, 1995),

considering

- a) that the International Telecommunication Union has, among its purposes, "to promote the extension of the benefit of the new telecommunication technologies to all the world's inhabitants" (No. 6 of the Constitution of the International Telecommunication Union (Geneva, 1992));
- b) that it is desirable, in this respect, to promote systems capable of providing a universal service;
- c) that new telecommunication services need advanced and reliable networks permitting high capacity communications;
- d) that systems based on the use of new technologies associated with both geostationary (GSO) and non-geostationary (non-GSO) low-Earth orbit satellite constellations are capable of providing the most isolated regions of the world with high-capacity and low-cost means of communication;
- e) that many of the Members of the Union are in need of such systems;
- f) that the operation of such systems requires a suitable amount of spectrum in appropriate frequency bands;
- g) that decisions on this matter should permit as many systems as possible to be operated;
- h) that in spite of the urgency attached to the development of such systems, technical, sharing and regulatory issues should be studied in order to achieve the most efficient use of the spectrum that may be available for these systems;
- i) that there is a need for the provision of services on a competitive basis between GSO FSS and non-GSO FSS as well as between non-GSO FSS and non-GSO FSS,

noting

- 1 that information relating to GSO and non-GSO systems in the fixed-satellite service in the 20/30 GHz bands has been communicated to the Radiocommunication Bureau;
- 2 that some of these systems are in operation and others will be operated in the near future and, consequently, difficulties may be experienced in modifying their characteristics;
- 3 the need to protect existing terrestrial services,

considering further

- a) that technical studies are required in order to ascertain the extent to which sharing of the frequency bands 20/30 GHz is feasible between GSO and non-GSO systems, between non-GSO systems and between non-GSO and terrestrial systems;
- b) that it is probable that non-GSO systems of the fixed-satellite service communicated to the Radiocommunication Bureau will not be brought into use before the 1997 World Radiocommunication Conference (WRC-97) and, consequently, the application of Resolution 46 (WRC-95) referred to in *resolves* 1 below does not need to take account of No. 2613 of the Radio Regulations;
- c) that the development of GSO and non-GSO systems in these bands is based on a major source of global investment and consequently their reciprocal coordination needs the firm commitment of all parties concerned on the basis of the application of Resolution 46 (Rev.WRC-95);
- d) that the provisional character of *considering further* b) above, and the economic impact of *considering further* c) above, makes it necessary for the study of any technical or regulatory issue to be completed well in advance of the date of WRC-97, with a view to permitting that Conference to review the regulatory provisions applying in the bands 18.8 - 19.3 GHz and 28.6 - 29.1 GHz;
- e) that WRC-97 should consider the non-application of No. 2613 of the Radio Regulations in the bands 18.8 - 18.9 GHz and 28.6 - 28.7 GHz in light of the spectrum requirements for non-GSO FSS systems and taking into account the results of the studies in the *further resolves* below,

resolves

- 1 that Resolution 46 (Rev.WRC-95) shall be applied in the bands 18.9 - 19.3 GHz and 28.7 - 29.1 GHz to frequency assignments of GSO and non-GSO systems of the fixed-satellite service as of 18 November 1995;
- 2 that as of 18 November 1995, No. 2613 of the Radio Regulations shall not apply in the bands 18.9 - 19.3 GHz and 28.7 - 29.1 GHz; however, the non-application of No. 2613 of the Radio Regulations in these bands shall be reviewed by WRC-97 in light of the studies referred to in the *further resolves* below;
- 3 that the respective status of satellite systems communicated to the Bureau prior to 18 November 1995 shall be that derived from the application of Articles 11 and 13 of the Radio Regulations;
- 4 that, when applying Resolution 46 (Rev.WRC-95) with respect to GSO systems to be taken into account, administrations intending to use non-GSO systems should afford appropriate protection to GSO systems in operation and those to be operated in the near future;
- 5 to urge administrations which have communicated their satellite systems in the bands 18.9 - 19.3 GHz and 28.7 - 29.1 GHz to the Radiocommunication Bureau prior to the date of this Conference to make every effort to reach agreement on the coordination of their respective systems,

further resolves

- 1 to request ITU-R to study, as a matter of urgency, the criteria to be applied for the sharing situations listed in *considering further* a) above, with a view to facilitating sharing, and taking account of existing and planned systems, and to recommend the required revisions of the Radio Regulations;
- 2 to instruct the Director of the Radiocommunication Bureau to ensure, in consultation with the Chairmen of study groups, committees and meetings, that the results of these studies are available in due time for consideration by WRC-97;
- 3 to recommend that WRC-97 review the results of the above studies and take appropriate action, including adjustments to spectrum allocations, for the harmonious development of GSO and non-GSO systems and terrestrial services in the bands 20/30 GHz, taking account of the conclusions reached on this matter by this Conference;
- 4 to urge the administrations concerned to cooperate to the maximum extent practicable in initiating the required coordination and to conduct such coordination with a view to reaching results acceptable to all the parties concerned,

instructs the Radiocommunication Bureau

to return any Appendix 3/Appendix 4 information received or considered to be received from administrations in relation to the FSS in the bands 18.8 - 18.9 GHz and 28.6 - 28.7 GHz after 17 February 1996 and until the last day of WRC-97. In such cases, the period referred to in No. 1550 of the Radio Regulations will be extended accordingly,

recommends

that future world radiocommunication conferences consider the results of studies relating to the benefits that may be derived from the use of low-orbit satellite technologies and, if necessary, identify additional bandwidths that may be used by non-GSO systems.

RESOLUTION PLEN-2

**REVIEW OF THE PROVISIONS OF THE CONSTITUTION RELATING
TO REVISIONS OF THE RADIO REGULATIONS**

The World Radiocommunication Conference (Geneva, 1995),

noting

- a) that, pursuant to Nos. 29 and 31 of the Constitution of the International Telecommunication Union (Geneva, 1992), the Radio Regulations are an instrument of the Union which complement the provisions of the Constitution and the Convention;
- b) that the provisions of No. 216 of the Constitution only apply to revisions of the Radio Regulations adopted prior to 22 December 1992;
- c) that revisions of the Radio Regulations adopted after the aforementioned date are governed by Nos. 217 to 223 of the Constitution;
- d) that the decisions of this Conference shall in all circumstances be in conformity with the provisions of the Constitution and Convention (see No. 92 of the Constitution),

considering

- a) that radio frequencies and the geostationary-satellite orbit are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the Radio Regulations, so that countries or groups of countries may have equitable access to both (No. 196 of the Constitution);
- b) that the Radio Regulations should be applicable to all the Members of the Union;
- c) that ratification, acceptance or approval of the Constitution and Convention (Geneva, 1992) binds Members to amendments of the Radio Regulations adopted prior to the date of signature of the Final Acts of the Additional Plenipotentiary Conference (Geneva, 1992);
- d) that subsequent amendments to the Radio Regulations apply, from the date of their provisional application, to all Members who have signed the respective Final Acts, *provisionally to the extent permitted by their national law* for a period of three years (No. 217 of the Constitution), and that Members are not required to make known the extent of this provisional application;
- e) that world radiocommunication conferences shall normally be convened every two years (No. 90 of the Constitution);
- f) that Members will be entitled to participate in such conferences with full voting rights even if they do not apply the previous revisions of the Radio Regulations;

g) that, during the period of provisional application, the status of application of the Radio Regulations in each Member country will be uncertain, and that as a result of the different time periods referred to in *considering* d) and e) above, it will become increasingly uncertain with each revision,

resolves to request the next ordinary Plenipotentiary Conference

to review the provisions of Nos. 217 to 223 of the Constitution in the light of the points raised under *noting* and *considering* in this Resolution,

resolves to invite Members of the Union

1 to propose to the next ordinary Plenipotentiary Conference, in accordance with No. 224 of the Constitution, appropriate amendments to the provisions of the Constitution pertaining to the entry into force of the Administrative Regulations, in particular the Radio Regulations, considering any consequential impact on the scheduling of conferences;

2 in respect of the revisions of the Radio Regulations adopted by this Conference for provisional application prior to the next World Radiocommunication Conference (WRC-97), to advise the Secretary-General of the status of their provisional application, or whether they consent to be bound or not, prior to WRC-97,

instructs the Secretary-General

to inform WRC-97 of the Members' responses in accordance with *resolves* 2.

RESOLUTION PLEN-3
**OPERATION OF GLOBAL SATELLITE SYSTEMS
FOR PERSONAL COMMUNICATIONS**

The World Radiocommunication Conference (Geneva, 1995),

considering

- a) that, in accordance with No. 6 of its Constitution (Geneva, 1992), one of the purposes of the Union is "to promote the extension of the benefits of the new telecommunication technologies to all the world's inhabitants";
- b) that, to this end, the Union is fostering the use of new technologies in telecommunications and is studying questions relating to this use in the Radiocommunication and the Telecommunication Standardization Sectors;
- c) that the Telecommunication Development Sector is studying questions aimed at identifying the benefits that developing countries may derive from using new technologies;
- d) that, among these new technologies, constellations of low-Earth orbit satellites may provide global coverage and facilitate low-cost communications;
- e) that the ITU Council, at its 1995 session, resolved in its Resolution 1083 that the theme "global mobile personal communications by satellite" be discussed at the first World Telecommunication Policy Forum established by Resolution 2 of the Plenipotentiary Conference (Kyoto, 1994),

recognizing

- a) that the spectrum available to global satellite systems for personal communications is limited;
- b) that successful coordination does not in any way imply licensing authorization to provide a service within the territory of a Member,

considering further

that other countries intending to use these systems should be guaranteed that they will be operated in accordance with the Constitution, the Convention and the Administrative Regulations,